

CLAIMS

1. A reverse flow combustor for a gas turbine, comprising

a cylindrical shaped combustor casing comprising an end cap disposed at one end and an open end in fluid communication with the gas turbine;

a cylindrical combustor liner disposed in the casing interiorly defining a combustion chamber and exteriorly defining a reverse flow fluid passageway between the casing and the liner;

a swirler and mixer assembly upstream from the combustion chamber, wherein the assembly comprises annularly arranged swirler and mixers, wherein each one of the annularly arranged swirler and mixers comprises a centerbody, an inner swirler attached to the centerbody, an outer swirler attached to the inner swirler and a shroud comprising an annularly tapered wall extending between each one of the swirler and mixers and the combustion chamber;

a domeplate intermediate the combustion chamber and the swirler and mixer assembly;

a primary fuel delivery system comprising a fuel source in fluid communication with each one of the swirler and mixers, wherein the primary fuel system is adapted to radially inject fuel into the outer swirler; and

a secondary fuel delivery system comprising a fluid passageway in the annularly tapered wall of the shroud, wherein the fluid passageway is in fluid communication with the fuel source, wherein the primary and secondary fuel delivery system can be independently controlled for each one of the four swirler and mixers.

2. The reverse flow combustor according to Claim 1, wherein the assembly comprises four annularly arranged swirler and mixers.

3. The reverse flow combustor according to Claim 1, wherein the domeplate further comprises a heat shield attached thereto, wherein the heat shield comprises an annular endbody.

4. The reverse flow combustor according to Claim 3, wherein the domeplate further comprises a plurality of fluid openings to provide an airflow that impinges upon a backside of the heat shield during operation of the gas turbine.

5. The reverse flow combustor according to Claim 3, wherein the cylindrical combustor liner comprises a plurality of openings about a primary combustion zone to provide an airflow that impinges upon the backside of the heat shield during operation of the gas turbine.

6. The reverse flow combustor according to Claim 1, wherein each one of the annularly arranged swirler and mixer assemblies are equidistant about a central longitudinal axis point of the combustor casing.

7. The reverse flow combustor according to Claim 1, wherein each one of the inner and outer swirlers are counter-rotating with respect to one another.

8. The reverse flow combustor according to Claim 1, wherein multiple combustors are installed on an axial turbine machine with cross-firing capability.

9. The reverse flow combustor according to Claim 1, wherein the combustor is connected to a turbine scroll via a seal.

10. The reverse flow combustor according to Claim 1, wherein the seal is a hula seal.

11. The reverse flow combustor according to Claim 1, wherein the shroud comprises a plenum in fluid communication with a fuel nozzle for introduction of a fuel from the fuel source, wherein the plenum is in fluid communication with the fluid passageway in the annularly tapered wall of the shroud.

12. A reverse flow combustor for a gas turbine, comprising:

a combustor casing comprising an elongated cylindrical combustor liner interiorly defining a combustion chamber and a reverse flow fluid passageway between the liner and the casing, wherein the combustor liner comprises a plurality of openings about a primary combustion zone, and a plurality of openings radially disposed in the liner about a dilution zone of the combustion chamber;

a plurality of swirler and mixer assemblies upstream from the combustion chamber; and

a generally planar domeplate intermediate the combustion chamber and the plurality of swirler and mixer assemblies comprising a heat shield attached thereto having an annular end body, wherein the domeplate further comprises a plurality of fluid openings to provide a plurality airflow passages that impinge upon a backside of the heat shield during operation of the gas turbine, and wherein the plurality of openings radially disposed in the liner about the primary combustion zone provide airflow passages that impinge on the backside of the heat shield during operation of the gas turbine.

13. The reverse flow combustor of Claim 12, wherein the combustor liner further comprises a plurality of ribs circumscribing an outer perimeter of the liner.

14. The reverse flow combustor of Claim 12, wherein the plurality of swirler and mixer assemblies upstream from the combustion chamber comprises four annularly arranged swirler and mixers equidistant about a central longitudinal axis of the casing.

15. The reverse flow combustor of Claim 14, wherein each one of the four annularly arranged swirler and mixers comprises a centerbody, an inner swirler attached to the centerbody, an outer swirler attached to the inner swirler and a shroud comprising an annularly tapered wall extending between each one of the four swirler and mixers and the combustion chamber.

16. The reverse flow combustor of Claim 12, further comprising a plurality of primary fuel conduits, wherein each one of the plurality of primary fuel conduits is in fluid communication with one of the plurality annularly arranged swirler and mixers; and a plurality of secondary fuel conduits, wherein each one of the plurality of secondary fuel conduits is in fluid communication with a fluid passageway in a shroud surrounding each one of the plurality annularly arranged swirler and mixers.

17. The reverse flow combustor of Claim 12, wherein the primary fuel delivery system may be replaced for operation with other fuels or mixture of fuels.

18. The reverse flow combustor of Claim 12, wherein the centerbody comprises a conical shaped leading edge.

19. A process for reducing NO_x emissions in a gas turbine employing a can-type combustor comprising a plurality of swirler and mixer assemblies, the process comprising:

independently operating a primary fuel delivery system to at least one of the plurality of swirler and mixer assemblies, wherein the primary fuel delivery system injects fuel into a swirler of the at least one swirler and mixer assemblies to operate at a different fuel to air equivalence ratio than the other swirler and mixer assemblies; and

operating a secondary fuel delivery system to each one of the plurality of swirler and mixer assemblies, wherein the secondary fuel delivery system injects a fuel to a combustion chamber via an opening disposed in a shroud surrounding each one of the plurality of swirler and mixer assemblies.

20. The process according to Claim 19, wherein operating the primary fuel delivery system comprises injecting the fuel into the plurality of swirler and mixer assemblies at an angle substantially perpendicular to the flow of fluid through each one of the swirlers in the plurality of swirler and mixer assemblies.

21. The process according to Claim 19, further comprising flowing air through openings formed in a domeplate and a combustor liner at an angle substantially perpendicular to a heat shield, wherein the domeplate is attached to the plurality of swirler and mixer assemblies, and wherein the heat shield comprises an annular end body attached to the domeplate.

22. The process according to Claim 19, wherein each one of the at least one swirler and mixer assemblies operates at a different flame temperature.

23. The process according to Claim 19, wherein one or more of the at least one swirler and mixer assemblies is not ignited during operation of the primary and secondary fuel delivery systems.

24. The process according to Claim 19, wherein the gas turbine is a microturbine having a centripetal arrangement or a can annular arrangement.

25. The process according to Claim 19, wherein the fuel source comprises a low BTU fuel.